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**D E C I S I O N**  
**of 28 October 1997**

**Case Number:** T 0117/94 - 3.2.5

**Application Number:** 85109506.7

**Publication Number:** 0170245

**IPC:** B29B 9/06

**Language of the proceedings:** EN

**Title of invention:**

Pellets of fibre-reinforced compositions and methods for  
producing such pellets

**Applicant/Patentee:**

KAWASAKI CHEMICAL HOLDING CO., INC.

**Opponent:**

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**Headword:**

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**Relevant legal provisions:**

EPC Art. 84, 76(1), 123(2), 54, 56

**Keyword:**

"Divisional application formulated in line with present patent  
(allowable)"

**Decisions cited:**

T 0257/89

**Catchword:**

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Boards of Appeal

Chambres de recours

Case Number: T 0117/94 - 3.2.5

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.5  
of 28 October 1997

**Appellant:** KAWASAKI CHEMICAL HOLDING CO., INC.  
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**Representative:** Caldwell, Judith Margaret  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 14 September 1993  
refusing European patent application  
No. 85109506.7 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** G. O. J. Gall  
**Members:** W. D. Weiß  
A. Burkhart

## Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the Examining Division on the refusal of the application No. 85 109 506.7.

The Examining Division held that the application did not meet the requirements of Articles 83 and 84 EPC and, as a consequence thereof, not of the Article 54 and 56 either.

- II. In a communication dated 4 February 1997 the Board pointed to that the application had been divided out from European application No. 82 300 150.8. The patent 0 056 703 granted on this parent application had been opposed and after opposition and subsequent appeal been maintained in amended form (T 257/89). The fibre-reinforced structures from which the pellets forming the subject-matter of this divisional application were produced by chopping had remained the subject-matter of the parent application. The parent patent had been maintained in the form of a product-by-process claim which had been amply discussed before the background of Articles 84, 54, and 56 EPC.

Since no closer prior art had been found in the present case, an independent claim formulated on the basis of the claim 1, finally granted in the parent patent and containing the additional feature of chopping the continuous structures into pellets being 2 to 100 mm long could probably be allowable.

III. The appellant, by letter of 18 July 1997, filed a new set of seven claims claim 1 of which reads as follows:

"1. Moulding pellets being cut to a length between 2 and 100 mm from a thermoformable fibre-reinforced structure comprising a thermoplastic polymer and at least 30% by volume of aligned reinforcing filaments which have been wetted by a melt of the thermoplastic in a melt pultrusion process, characterised in that the filaments have been wetted by a melt which has a viscosity at low shear rates of less than 100 Ns/m<sup>2</sup> so as to give pellets which can be injection moulded into an article in which the fibres are present in the form of individually dispersed filaments at least 50% by weight of which retain a length of at least 2 mm in the moulded article."

IV. Oral proceedings were held before the Board on 28 October 1997 in the course of which the appellant filed an auxiliary request based on another set of seven claims and respective amendments to the description. Claims 1, 6 and 7 read as follows:

"1. Moulding pellets being cut to a length between 2 and 100 mm from a thermoformable fibre-reinforced structure comprising a thermoplastic polymer and at least 30% by volume of aligned reinforcing filaments which have been wetted by a melt of the thermoplastic in a melt pultrusion process, characterised in that the filaments have been wetted by a melt which has a viscosity at low shear rates of less than 100 Ns/m<sup>2</sup> so as to give pellets in which the extent of wetting is at least 70%.

6. A composition comprising a blend of moulding pellets according to any one of Claims 1 to 4 and pellets of other thermoplastic products.

7. A fibre-reinforced thermoplastic moulded article formed from pellets of claim 1."

V. The appellant finally requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 7, filed on 18 July 1997 (main request) or claims 1 to 7 and amendments to the original description filed during oral proceedings on 28 October 1997 (auxiliary request).

VI. The amended description for the auxiliary request comprises pages 1 and 2, with insertions "X-X" and "A-A" on page 2, filed at oral proceedings on 28 October 1997, and pages 3 to 33 as published.

With letter of 5 November 1997, received on 6 November 1997, the appellant submitted a clean copy of pages 1, 2 and 2a which replace pages 1 and 2 of the patent as published.

VII. With the same letter the appellant submitted a clean copy of the claims 1 to 7 according to the auxiliary request.

VIII. The appellant argued as follows:

The term "... which can be injection moulded into an article in which the fibres are present in the form of individually dispersed filaments at least 50% by weight of which retain a length of at least 2 mm in the moulded article" was technically equivalent to the term "... so as to give a continuous structure having a longitudinal flexural modulus determined by ASTM D790-80 of at least 70% of the theoretically attainable flexural modulus." The latter term was, however, acceptable to the appellant in terms of the ease of demonstrating infringement. The former term, on

the contrary would present difficulties in enforcement, because the flexural modulus was no longer measurable on the short pellets.

The determination of the flexural modulus on the continuous structure was only one method to determine the extent to which the surface of the reinforcing fibres had been wetted by the melt. It was easier to perform than the direct method which consisted in disintegrating the structures and visually inspecting the surfaces of the embedded fibres, and in the range of 70% and more the results were identical. It was also more reliable and easier to perform than the weighing method described in Example 1, because it compared the measured value with a value obtained by a calculation using the rule of mixture on the basis of the known moduli of the two components of the structure.

## Reasons for the Decision

### 1. *Main request*

The originally filed documents of the parent application 82 300 150.8 disclose that pellets which have been cut from a structure which, after having been produced by a particular pultrusion method, has a longitudinal flexural modulus determined by ASTM D790-80 of at least 70% of the theoretically attainable flexural modulus can be injection moulded into an article in which the fibres are present in the form of individually dispersed filaments at least 50% by weight of which retain a length of at least 2 mm in the moulded article (see EP-A-0 056 703, page 16, third paragraph, to page 17, first paragraph, and claims 1, 3 and 5). Therefore according to the original disclosure, the particular structure of the moulded articles is

dependent on the moulding pellets having been cut from continuous structure produced by a particular process thus that they thereafter have a minimum value of the flexural modulus. This means that the set of moulding pellets which can be moulded into an article having this specific structure, in the terms of the set theory, is disclosed as a subset of the set of the moulding pellets having the minimum value of flexural modulus. The Board cannot find any original disclosure for the respondent's assertion that the said subset and the said set are identical.

The set of claims according to the main request mentions the feature concerning the minimum value of the flexural modulus only in the dependent claim 2. This means that the set of moulding pellets being cut from a continuous structure having this minimum value of the flexural modulus has now become a subset of the moulding pellets which can be moulded into articles having the specific structure.

Consequently, claim 1 according to the main request offends against Article 76(1) EPC, the main request, therefore, not being allowable.

## 2. *Auxiliary request*

### 2.1 Amendments

Claim 1 according to the auxiliary request contains the feature "...so as to give pellets in which the extent of wetting is at least 70%" instead of "... so as to give a continuous structure having a longitudinal flexural modulus determined by ASTM D790-80 of at least

70% of the theoretically attainable flexural modulus" contained in the original claim 1 of the present divisional application as well as of the original claim 1 of the parent application.

In the description as filed of the present application (see page 1 to page 2, line 15, which is identically taken from the parent application) there is explained, based on the generally known rule of mixtures, that the percentage of the longitudinal flexural modulus only stands for the extent of wetting, 100% of the theoretical flexural modulus corresponding directly to 100% extent of wetting. It is, however, obvious to any person skilled in the art, that the measurement of the longitudinal flexural modulus is only one method to determine the extent of wetting which is normally easier to carry out than the direct method which would consist in disintegrating the composite structure and microscopically inspecting the surfaces of the reinforcing fibres. It is also easier to perform than the weighing method defined in Example 1, because this method involves the preparation of an ideally wetted standard sample for comparison.

In summary, it is quite clear from the context of the documents as filed of the parent application as well as the present divisional application that the parameter responsible for the positive effects of the invention is the "extent of wetting" and the standard method by which it is to be determined is the determination of the longitudinal flexural modulus reinforced structures which standard method may be used to calibrate other imaginable methods.

Consequently, claim 1 meets the requirements of Articles 76(1) and 123(2) EPC.



The Board has not found any inadmissible amendment in the dependent claims and the description either.

## 2.2 Clarity

In the final decision on the maintenance of the parent patent No. 0 056 703 (see T 257/89, point 3 of the reasons), the Board of Appeal has found that the feature that the filaments "have been wetted by a melt of the thermoplastic in a melt pultrusion process" is to be construed as meaning that the achieved structure is substantially free of solvents and that the product of this melt pultrusion process thereby differs from a product obtained by a solution pultrusion process.

Moreover, it has been found that the feature "wetted by a molten thermoplastic polymer from a melt which has a viscosity at low shear rates of less than 100 Ns/m<sup>2</sup>", characterises the product itself insofar as it defines the structural feature that the thermoplastic polymer has a low molecular weight.

The effect of these features which characterise intermediate method steps may be veiled by subsequent method steps which complete the production of the final product in a manner that the parameter characterising the intermediate step is no longer directly measurable on the final product. The molecular weight of the polymer matrix may, for instance, be increased by measures subsequent to the wetting step (see EP-A-0 170 245, page 16, second paragraph). These features, however, leave their traces in the final product insofar as the extent of wetting of the fibres in the final product is above 70% which value, as has been affirmed by the appellant, would not have been reached without these features being present during the intermediate steps.

These inconveniences principally inherent in the interpretation of product claims which are (partly) characterised by process features have lead the Boards of Appeal to admit product-by-process claims only in those cases in which the claimed product cannot be described in any other way (see Case Law of the Boards of Appeal, 1996, part II.B, 6.3).

The Board is convinced that this requirement is met by the moulding pellet of the present divisional application.

Claim 1, therefore, does not offend against the requirement of clarity in the meaning of Article 84 EPC.

### 2.3 Novelty and inventive step

As explained in detail under point 2.1. above, the extent of wetting is equivalent to the percentage of the longitudinal flexural modulus measured on the continuous structure from which the pellets which form the subject of the present application are cut.

Therefore, claim 1 according to the auxiliary request of the present divisional application claims moulding pellets which are cut from continuous structures which are novel and inventive having regard to the prior art cited in the case of the parent patent and on which therefore an amended European patent No. 0 056 703 has been finally granted by decision T 257/89 of the Board of Appeal. No closer prior art has been found in the present case.

Since the Board is in agreement with the conclusions in the said decision in the case of the parent patent, the subject-matter of claim 1 according to the auxiliary request is also novel and involves an inventive step.

Claim 1 is, therefore, allowable.

- 2.4 Claim 7 refers to a fibre-reinforced thermoplastic moulded article formed from pellets of claim 1.

Although the structure of the pellets is lost by the moulding process, the appellant, at oral proceedings, demonstrated on the basis of samples that articles moulded from pellets according to the invention differ from articles moulded from pellets according to the closest prior art by the equal distribution of individual fibres. The article moulded according to US-A-4 037 011 comprised an inhomogeneous distribution of the fibres characterised by cluster formation.

There is no indication in the prior art found so far that a good wetting of the reinforcing fibres in moulding pellets has this advantageous effect on the moulded article.

Claim 7 is, therefore also allowable.

- 2.5 The dependent claims 1 to 6 and the amended description are not subject to any objections either.
- 2.6 The auxiliary request is, therefore, allowable.

## Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent
  - with a clean copy according to VII. of this decision of claims 1 to 7 according to the auxiliary request filed at oral proceedings on 28 October 1997,
  - with an adapted description according to VI. of the decision.

The Registrar:



A. Townsend

The Chairman:



G. Gall